Fabrication of metallic and ceramic photonic crystals using microtransfer molding methods

J. H. Lee, H. Kang, C. H. Kim, J. H. Ahn, W. Y. Leung, Y. S. Kim, R. Biswas, C. H. Oh, K. M. Ho, and K. Constant

Department of Physics, Ames Laboratory, Iowa State University, Ames, IA 50011, USA
and
Hanyang University, Korea

We present fabrication methods and optical data of 3D metallic and dielectric photonic crystals. The fabrication methods are based on soft lithographic techniques that include layer-by-layer template fabrication, structure alignment and ceramic infiltration. These methods can be easily extendable for introduction of defects in 3D photonic crystals. With these techniques, freestanding metallic crystals and titania crystals on a silicon substrate have been fabricated. Since the crystals have systematical spatial deviations in their structures, structure-dependent optical properties were investigated in a single sample by means of an infrared spectral imaging. We will present the effect of alignment errors on the optical signature in the 3D photonic crystals fabricated by these methods. The tolerance of alignment for both metallic and dielectric 3D photonic crystals will also be discussed.